

SPECIAL HANDLING

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X-270

PROGRESS REPORT

Period of May 1, 1964 to May 31, 1964

Contract AF33(600)40280

SPECIAL HANDLING

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A. F-101 FLIGHT TEST

The first of three flights, S-107, produced very good mapping of the Newport News-Norfolk area, despite video level fluctuations. On the two succeeding flights, the system was operated in various radar modes between 20,000 and 45,000 feet altitude to determine the cause of video striping. None of the tests performed were successful in isolating the trouble. A film drive malfunction at the start of the run on S-109 prevented recording data.

The major effort this month was devoted to determining the cause of the random video fluctuation. The entire radar, including the antenna, was removed from the aircraft and operated in an altitude chamber. With an artificial target introduced into the antenna, output video was recorded on the primary film. As the system on the armament door and antenna were vibrated at altitude, no changes in video level were detected.

Since variations on either the +1000 or -1000 volt power supply could cause striping, both output voltages were monitored on magnetic tape. However, no variations occurred in flight.

The March progress report indicated a compensation error of 2:1, which has been found to be the use of an incorrect scale for the accelerometer. Although the integrator network was driven negative when the accelerometer was connected on flight S-108, it was still within the recording range of the instrumentation, allowing analysis of the results. Data indicated the accelerometer network caused offset frequency changes which would have correctly compensated for aircraft accelerations.

A parametric amplifier was installed on the system, providing a 4.1 db noise figure during ground tests. No flights have yet been made with the paramp.

B. PHASE II FLIGHT TEST

The first delivered radar mounted on its dolly was operated from the cables in the test plane using ground power. Power supply voltages, video noise level, and transmitter servo operation checked out. An error in the accelerometer scale factor will be checked with the supplier. Malfunction of the test cart for the INS system prevented test of the film speed control. When the antenna space is free for work, the antenna must be aligned and centered before checking antenna operation.

After ruggedization of the structure to reduce vibration resonances encountered in environmental tests, Transmitter 002 was delivered to the field and tested. Performance was good, with 90 watts average output power. Transmitter 001 was returned to the factory for the mechanical modification.

The cathode ray tube was replaced in Recorder 005 because of unsatisfactory bias versus film transmittance transfer function. Tests on the new CRT were satisfactory, although the transfer function was not as linear as on other Recorders.

Film is now being developed at the testing area, although the development parameters, particularly developer replenishment rate, are not yet fully determined.

Film processed on the Correlator showed noise to be within acceptable limits. One unwanted frequency was detectable, but tolerable.

Magnetic fields present in the installation location of the Recorder were measured with a gaussmeter, both with and without the Recorder in place. Fields were within acceptable limits.

Some minor modifications have been made to the radar. The Recorder automatic brightness control output to the instrumentation was attenuated 5 to 1. A push button switch for providing range marks was installed in Synchronizer 001. Some minor corrections were made to the Functional Test Unit for the Single Axis Platform. A diode was added in the Radar Junction Box to prevent control of the Standby light by the instrumentation. Additional sections of waveguide are being fabricated using quick-disconnect flanges.

Completion of the corner reflectors is still scheduled for June 15. The reflector alignment tool has been completed. Six spherical reflectors will be procured to indicate absolute target detectability levels in flight. Two each of the following sizes are to be provided:

Diameter Inches	Target Area Sq. Ft.
6	0.20
18	1.77
36	7.05

C. ENVIRONMENTAL TEST

Tests have been conducted on a section of flexible waveguide used to interconnect the transmitter and antenna. The tests consisted of flexing the guide over a full 60° at the rate of 100 cycles per hour with an internal pressure of 30 psi and a temperature of 550°F . No significant change was noted in the measured values of VSWR, insertion loss and power handling capability after 2000 cycles (20 hours exposure).

D. SYSTEM EVALUATION

SOARD Technical Memo 158 was written concerning recorder resolution improvement due to high frequency boost. The use of a high frequency boost amplifier preceding the CRT film recorder should:

- (a) give a recorder resolution improvement of about 15%, based on obtaining a 7% dip in the composite response for two impulse targets,
- (b) give a recorded pulse whose width at the -3 db points is narrowed by 18%,
- (c) give time sidelobes down at least 30 db.

High frequency boost, therefore, appears to provide a useful, though not spectacular, resolution improvement, while maintaining an acceptable time side-lobe level. It remains to investigate the effect of the receiver response on these conclusions, and experimental verification is especially desired.

As a separate item, this memo also considers the effect of target RF phase on recorder resolution. Average resolution is some 30-35% better for the random phase condition than for the conventional in-phase case, whether boost is used or not. However, it is probably best to ignore this improvement in the system resolution budget.

E. RECORDER

Modifications were completed on Recorder 006. Recorder 005 is to be returned to Itek for modification.

Design work has been completed at Itek.

F. ANTENNA

Heat-pressure tests of the I8 fabric have been discontinued with no failures encountered after 750 hours exposure to 550°F and 20 hours at -65°F.

Bonding the I8 fabric with a new process on a sample module has encountered two failures from correctable causes. All six modules for Antenna 003 (spare) have been removed from the antenna, stripped, cleaned and are ready for bonding following successful bonding on the sample.

G. SPARES

Five items were added to the system spares list, making 1051 active items, of which 962 have been delivered to the government. Two of the open items have not been ordered, 8 are incomplete Model Shop items, and 79 are open purchase orders.

With the Ground Support Equipment spares, 540 of the 591 items have been shipped. One item was added during May.